Montana Department of Environmental Quality

Water Protection Bureau
P.O. Box 200901
Helena, MT 59620-0901

PERMIT FACT SHEET

MONTANA GROUND WATER POLLUTION CONTROL SYSTEM (MGWPCS)

Permittee:	Big Sky Progress, LLC
Permit Number:	MTX000189
Permit Type:	Domestic wastewater
Application Type:	Renewal
Facility Name:	Town Pump – Lockwood
Facility Location:	Yellowstone County Southwest ¼ of Section 19, Township 1 North, Range 27 East; Latitude: 45.816274°, Longitude: -108.41669°
Facility Address:	2711 North Frontage Road
Facility Contact:	Traci Ruschetti, Environmental Manager, Town Pump Inc.
Treatment Type:	Level 2
Receiving Water:	Class II Ground Water
Number of Outfalls:	1
Outfall / Type:	001 / pressurized subsurface drainfield (9 zones)
Effluent Type:	Domestic strength wastewater
Mixing Zone:	Standard
Effluent Limit Type:	WQBEL
Effluent Limits:	60% nitrogen reduction (influent to effluent, total nitrogen) Total nitrogen: 5.55 lbs/day
Flow Rate:	Design maximum: 21,500 gpd Design average: 15,800 gpd
Effluent sampling:	Quarterly, dose tank
Influent sampling:	Quarterly, influent monitoring port prior to septic tanks
Fact Sheet Date:	November 2018
Prepared By:	Darryl Barton

1.0 PERMIT INFORMATION

DEQ issues MGWPCS permits for a period of five years. The permit may be reissued at the end of the period, subject to reevaluation of the receiving water quality and permit limitations. This fact sheet provides the basis for DEQ's decision to renew a MGWPCS wastewater discharge permit to Big Sky Progress, LLC (applicant) for the Town Pump - Lockwood wastewater treatment system.

1.1 APPLICATION

DEQ received an application for renewal of the permit on August 20, 2018. Renewal fees accompanied the application. DEQ reviewed the submittal and issued a completeness letter on September 4, 2018.

1.2 PERMIT HISTORY

Big Sky Progress LLC. operates under the more common name of Town Pump. The original permit for this system went into effect in 2007. A renewal permit was issued September 1, 2013.

Effluent limitations for nitrogen were set at 3.88 lbs/day maximum and 60 % minimum nitrogen removal. Phosphorus limitation of 510 lbs/year was established.

1.3 CHANGES TO THIS PERMIT

A new nitrogen effluent load has been calculated for this permit based on ambient water quality information obtained through the installation of a new monitoring well.

2.0 FACILITY INFORMATION

2.1 LOCATION

The TOWN PUMP - LOCKWOOD wastewater treatment system is located 4 miles northeast of Billings just off Interstate 90 at the junction of Johnson Lane and the North Frontage Road in the Lockwood community (**Figure 1**). Town Pump operates a high volume 24-hour gas station and truck stop with the following features: convenience store, casino, pay-shower, laundry and three restaurants. The wastewater system is in the northwestern portion of the property **(Figure 2)**.

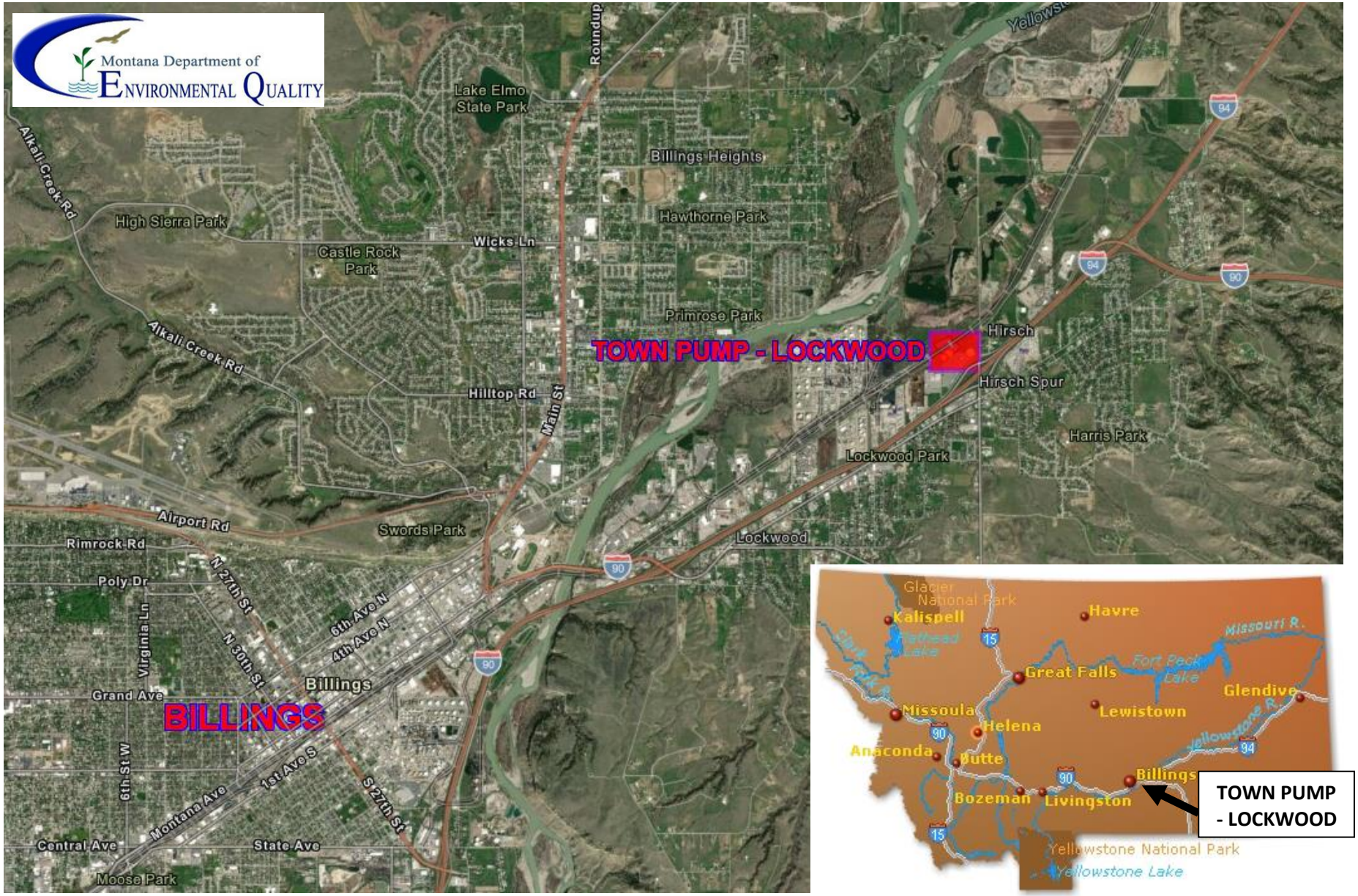


Figure 1. Location of the TOWN PUMP - LOCKWOOD

Figure 2. Town Pump Wastewater System.

2.2 OPERATIONS

System operations are summarized below in **Table 1**.

Table 1. Collection, Treatment, and Disposal System Summary	
Inflows	
Contributing Sources of Wastewater: Commercial In-Nature Standard Industrial Code(s) (SIC) of sources: 5499 - Misc. Food Stores; 5541 - Gasoline Service Station The number of connected residences: 0 The number of connected business: 1 commercial connection Influent Sampling Location: INF-001 – after Trash Tank and Grease Interceptor, prior to Septic Tanks	
Treatment	
Grease Interceptor, Trash Tank and Septic Tanks for primary treatment followed by advanced treatment in a Recirculating Sand Filter (RSF)	
Treatment Level: Level 2	
Location: 45.81648° Latitude and -108.41870° Longitude	
Disposal System	
Disposal Structure: Pressure-dosed subsurface drainfield (Outfall 001); nine zones	
Method of Disposal: Infiltration to ground water	
Location: 45.81677° Latitude and -108.41803° Longitude	
Average Daily Design Flow (gpd): 15,800	Daily Maximum Design Flow (gpd): 21,500
Effluent Sampling Location: EFF-001: Outfall 001 - Dose Tank	
Flow Monitoring Equipment: FM-001, FM-002, FM-003: Orenco - FM200 - Flow Meters (3): turbine type.	

Wastewater is split to two treatments before coming back together for further treatment. Restaurant wastewater runs through a 20,000-gallon grease receptor, while the restroom waste runs through a 10,000-gal trash tank. After the grease and trash are removed, flow is combined into two 30,000-gal septic tanks in series for primary treatment. Water then enters a recirculating tank that delivers it to the recirculating sand filter (RSF). Recirculating sand filters spray effluent over a bed of sand. The wastewater is filtered by the sand and treated by microbes that live there. Four-fifths (80%) of the wastewater is routed back to the recirculation tank. 20% is diverted to a 4,000-gal drainfield dose tank. Effluent leaving the dose tank is pressure-dosed into a subsurface drainfield (Outfall 001) that is divided into nine zones to evenly distribute the effluent. The subsurface drainfield effluent is further treated by soil and soil microorganisms.

Three Orenco© FM200 flow meters measure the flow rate. They are positioned between the dose tank and the drainfield (FM-001, FM-002, FM-003).

Figure 3 is a line drawing of the collection, treatment, and disposal process.

Figure 3

Town Pump Travel Plaza-Lockwood Line Diagram

Revised 2018

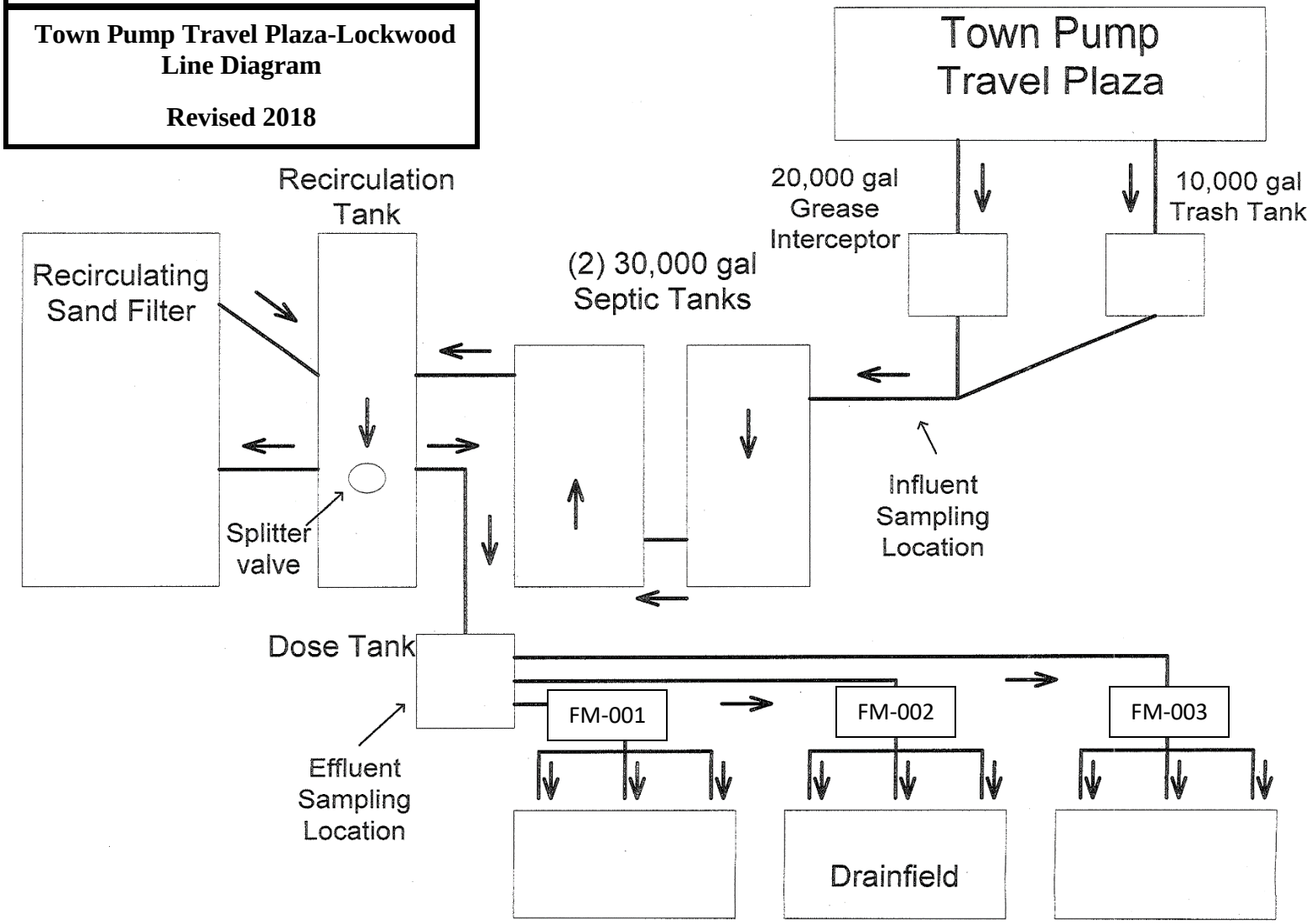


Figure 3. Wastewater Treatment System Line Diagram

2.3 EFFLUENT CHARACTERISTICS

DEQ requires a permit applicant to disclose the quality of the effluent so that DEQ may evaluate the potential for pollution of state water. During the previous permit cycle, the facility sampled and reported effluent quality criteria to DEQ in the form of discharge monitoring reports (DMRs). The most important aspect of effluent monitoring for this permit is nitrogen removal. Specifically, 60 % nitrogen removal is required from the influent sampling to the effluent sampling. These data are summarized below in **Table 2**.

Complete effluent and influent quality data follow in **Table 3**.

Table 2. Water Quality Data - Nitrogen Removal

Quarterly Sample Date	Nitrogen, total [as N] Influent mg/L (1)	Nitrogen, total [as N] Effluent mg/L (1)	Nitrogen, total, percent removal 60 % minimum (2)	Nitrogen, total [as N] Effluent 3.88 lb/day max (3)
12/31/2013	88.60	38.10	**57.00**	2.92
03/31/2014	108.00	16.40	84.80	1.27
06/30/2014	101.00	14.50	85.60	1.27
09/30/2014	103.00	11.00	89.30	0.70
12/31/2014	98.00	16.70	83.00	1.79
03/31/2015	98.60	14.20	85.60	1.04
06/30/2015	97.20	14.80	84.77	0.91
09/30/2015	90.80	14.40	84.14	1.48
12/31/2015	90.80	14.40	84.14	0.44
03/31/2016	83.00	38.90	**53.13**	2.14
06/30/2016	108.00	14.90	86.20	0.71
09/30/2016	81.00	10.50	87.04	1.08
12/31/2016	94.00	18.40	80.43	0.90
03/31/2017	100.00	34.20	65.80	1.66
06/30/2017	310.00	27.30	91.19	1.84
09/30/2017	80.00	19.00	76.25	0.77
12/31/2017	96.40	45.50	**52.80**	**4.44**
03/31/2018	95.20	43.50	**54.30**	2.40
06/30/2018	91.60	42.30	**53.82**	3.07
Average values	**106.87**	**22.59**	**76.97**	**1.54**

Footnotes:
(1) Influent and Effluent concentrations are considered the quarterly average.
(2) Permit requires at least 60 % nitrogen removal from influent to effluent.
(3) Permit effluent limit of 3.88 lb/day maximum Nitrogen (total N).
Red Values indicate a violation of water quality limits.

The last three quarterly samples have shown that the system is failing to meet permit limits for the reduction of nitrogen. Also, there was an exceedance in nitrogen load in pounds per day (12/31/2017). **It will be important to return the system to at least 60% reduction of nitrogen to avoid noncompliance and enforcement.**

Table 3: Effluent and Influent Quality – Outfall 001 - Per DMR Values

Parameter	Location	Units	Minimum Value	Average Value	Maximum Value	No. of Samples
Biochemical Oxygen Demand (BOD_5)	EFF	mg/L	4	9.31	22	19
Flow rate	EFF	gpd	3,684.00	8,297.99	12,829.00	19
Nitrate + Nitrite (as N)	EFF	mg/L	0.15	3.77	7.14	19
	INF		0.01	0.041	0.14	19
Total Ammonia (as N)	EFF	mg/L	4.00	17.13	45.00	19
Total Kjeldahl Nitrogen (as N)	EFF	mg/L	4.30	18.96	44.40	19
	INF		NR	NR	NR	19
Total Nitrogen (as N)	EFF	mg/L	10.50	23.63	45.50	19
		lbs/day	0.44	1.62	4.44	19
	INF	mg/L	81.00	95.01	108.00	19
Total Phosphorus (as P)	EFF	mg/L	4.70	10.18	13.40	19
		lbs/day	0.29	0.70	1.04	19
Total Suspended Solids (TSS)	EFF	mg/L	10.00	11.00	17.00	7

Period of Record: 03/2009 through 03/2013

Footnotes:

BOD_5 = Biochemical Oxygen Demand

CFU = Colony Forming Unit

EFF = Effluent at drainfield dose tank

INF = Influent at Septic tank

(1) Self-Reported Discharge Monitoring Reports

2.4 GEOLOGY

The Natural Resources Conservation Service (NRCS) Soil Survey indicates that this site's soils consist of two soil types, Lambert soils and McRae loam. The drainfield is the most important area for soils as they are the primary form of treatment and filtration before entry into the groundwater table. The drainfield is located within McRae loam. McRae loam has 1 to 4% slope and loamy alluvium parent material. In 2006 fourteen test pits were excavated and studied in the area of the current drainfield. Soils from the drainfield beginning depth (2 – 3 feet) were described as loamy sand and fine sandy loam to depths of about 6 feet. This soil type provides an excellent drainfield soil both in terms of filtration and percolation. Sand and gravel concentration increases with depth.

Lambert soils are found south of the McRae loam and upgradient of the drainfield based on a northwest direction of ground water flow. The Lambert soil is a silt loam with alluvium parent material and 7 to 35% slopes.

Unconsolidated Quaternary deposits in this area consist of modern alluvium associated with the active channels of the Yellowstone River. On the south side of the river, three to five different terrace deposits have been identified which parallel the Yellowstone River. Terrace 1 is the lowest surface above the floodplain, but is not continuously deposited through-out the area. Terrace 2b has been identified in the Lockwood area. Thick (40 to 100 feet) deposits of fine-grained alluvium overlie Terrace 2b in this area. Beneath the terrace deposits is a basal

layer of coarse gravel and sand. This gravel and sand zone is considered to be the primary ground water-bearing unit in the area. South of the Yellowstone River, it overlays the Cretaceous Colorado Shale.

2.5 HYDROGEOLOGY

The Yellowstone River valley typically consists of a coarse-grained alluvium topped by fine-grained alluvium. The fine-grained upper layer is 100 feet thick in places. The bottom coarse-grained layer consisting of mostly sand and gravel, ranges in thickness from 10 feet up to 40 feet thick. This sand and gravel produces most of the water for the area. Above the modern Yellowstone River valley is a network of terrace surfaces formed through erosion and deposition. Bedrock units of shale or sandstone are exposed occasionally in the upper terrace surfaces.

The 2007 permit and renewal application supply information describing the hydrogeological conditions for the site as measured in 2006. Three monitoring wells were used to estimate a hydraulic gradient of 0.0094 ft/ft. Ground water is estimated to be moving N42^{o}W. A 2005 pump test measured the hydraulic conductivity as 127 ft/day. Measurements taken in September 2006 from on-site monitoring wells show average depth to ground water is 15.66 feet below ground surface.

There are three surface waters within one mile of Outfall 001. The closest is a wetland that is 1,160 feet from the drainfield. The other surface water bodies include a gravel pit (2,093-feet) and the Yellowstone River (3,395).

Important hydrogeologic characteristics are summarized below in **Table 3**.

Table 3: Hydrogeologic Summary	
Average depth to ground water	15.66 feet
General ground water flow direction	N42°W
Hydraulic conductivity	127 feet per day
Hydraulic gradient	0.0094 feet/feet
Nearest downgradient surface water	Wetland (unnamed) 1,160 feet

2.6 GROUND WATER MONITORING WELLS

There is one monitoring well associated with this permit: MW-1. This monitoring well is plotted on **Figure 2**. Monitoring well construction details are provided below in **Table 4**. Driller's log for this monitoring well are attached as **Appendix A**. Water from this well represents ambient background water from the shallow receiving ground water upgradient of Outfall 001.

Table 4. Monitoring Well Summary
Monitoring Well: MW-1
MBMG GWIC #: 285612
Status: Constructed on December 2, 2015 as a condition of the permit
Location: Southwest portion of property, grassy field just off North Frontage Road, Lockwood Latitude: 45.81335^{o} Longitude: -108.41872^{o}
Representation: Ambient quality of the shallow receiving ground water, upgradient of Outfall 001.

If a DEQ-approved monitoring well is abandoned, destroyed or decommissioned, or is no longer able to be sampled due to fluctuations in the ground water table, the permittee must install or designate a new well to replace the abandoned, destroyed, decommissioned, or non-viable well.

2.7 GROUND WATER QUALITY CHARACTERISTICS

Water sampling results from MW-1 are provided below in **Table 5**. Based on the 2100 microsiemens per centimeter (µS/cm) specific conductance, the receiving water is Class II ground water. The total nitrogen concentration in the receiving water is **1.54 mg/L**. This will be used in calculating the effluent limit for nitrogen.

Table 5. Ground Water Monitoring Results

Monitor Source[1]	Representation	Parameter	Units	Reported Minimum Value	Reported Average Value	Reported Maximum Value[2]	# of Samples	Source of Data
MW1	Ambient Ground Water Quality Shallow ground water, 1100 feet upgradient from Outfall 001	Chloride (as Cl)	mg/L	19.00	20.33	21.00	3	APP
		Escherichia coli Bacteria	CFU/100 ml	<1	<1	<1	3	APP
		Nitrogen, Nitrate + Nitrite (as N)	mg/L	1.15	1.54	2.05	3	APP
		Nitrogen, Total Kjeldahl (as N)	mg/L	ND	ND	ND	3	APP
		Nitrogen, Total	mg/L	1.20	1.54	2.00	3	APP
		Organic Carbon, Total (TOC)	mg/L	2.10	2.53	3.00	3	APP
		pH	s.u.	7.30	7.33	7.40	3	APP
		Specific Conductivity (@ 25°C)	µS/cm	2080	2100	2130	3	APP
		Total Dissolved Solids (TDS)	mg/L	1690	1717	1730	3	APP

Footnotes:

APP = Application Form GW-2 and supplemental materials.

CFU = Colony Forming Units

ND = Not Detected

Period of Record: 12/27/2017 through 06/15/2018.

s.u. = standard units

(1) Refer to the Fact Sheet (Figure 2) for the location of the monitoring well.

(2) Maximum value recorded of all monthly or quarterly reported values.

3.0 WATER QUALITY STANDARDS AND NONDEGRADATION

Ground water is a water of the state. The State of Montana uses several water quality measures to protect, sustain, and improve the quality of state waters. These water quality limitations provide the basis for effluent limits that DEQ applies to discharge permits (**Section 5**). DEQ protects all designated uses of state water by basing effluent limits on the most restrictive water quality limitations, intended to protect the most sensitive uses.

3.1 BENEFICIAL USES

With a specific conductivity of **2100 µS/cm** (**Table 5** above), the receiving water is **Class II** ground water (specific conductance that is greater than 1000 and less than or equal to 2,500 µS/cm). Class II ground waters must be maintained so that they are **at least marginally suitable** for the following uses with little or no treatment:

- Public and private drinking water supplies
- Culinary and food processing purposes
- Irrigation
- Drinking water for livestock and wildlife
- Most commercial and industrial purposes

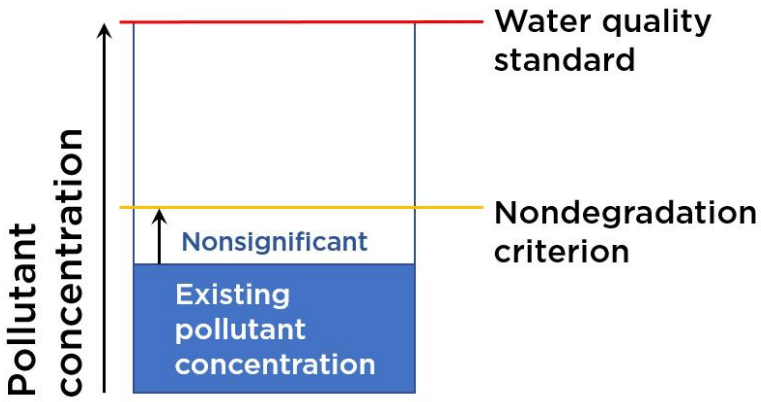
DEQ protects all the assigned beneficial uses by protecting the most sensitive. Drinking water is the most sensitive use of this receiving water.

3.2 WATER QUALITY STANDARDS

DEQ's ground water standard for nitrate is 10.0 mg/L, as is the standard for nitrate + nitrite (as nitrogen). Class II ground water must be maintained at least marginally suitable for use as a drinking water supply with little or no treatment, and therefore must meet the corresponding human health standard of 10.0 mg/L total nitrogen. These water quality standards may not be exceeded outside a designated mixing zone (**Section 4**).

3.3 NONDEGRADATION

Montana's nondegradation policy is intended to preserve high-quality state waters. Any water whose existing condition is better than the water quality standards must be maintained in that high quality. Nondegradation policy states that certain types of common activities cause nonsignificant changes in water quality, and provides criteria for determining whether changes in water quality are significant.



Nonsignificant changes do not require further nondegradation review. Therefore, DEQ must determine whether the proposed discharge will result in significant changes in water quality.

3.4 NONSIGNIFICANCE

When developing the initial permit (2007), DEQ determined that discharges in compliance with this permit result in nonsignificant changes in water quality. This discharge has not increased since this determination, and therefore DEQ did not perform a new significance determination for this permit renewal. DEQ determined that the discharge continues to meet ground water nonsignificance / nondegradation criteria (described below) at the end of the mixing zone (**Section 4**). DEQ used these criteria and updated ground water quality data to establish effluent limits (discussed below in **Section 5**).

For this discharge to ground water, the following nonsignificance criteria are relevant:

Nitrogen

Under Montana statute, ground water total nitrogen at or below 7.5 mg/L at the downgradient end of the mixing zone (see **Section 4**) is a nonsignificant change in water quality, so long as the discharge does not cause degradation of surface water. Using the nonsignificance criterion of 7.5 mg/L, DEQ established effluent limits that

cause the discharge to comply with ground water nonsignificance/nondegradation criteria at the end of the mixing zone. This is discussed in detail in **Section 5.1**.

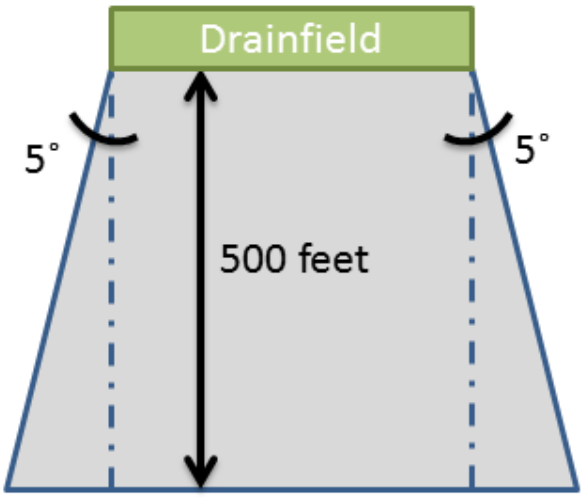
Phosphorus

A total phosphorus surface water breakthrough time of greater than 50 years is a nonsignificant change in water quality. The phosphorus criterion requires an analysis to determine a breakthrough time. Breakthrough occurs when the subsurface soils lose their capability to adsorb any more phosphorus, and it reaches surface water. Factors considered in calculating phosphorus breakthrough include: the shallow ground water flow direction (N42°W), distance to the nearest surface water (unnamed Wetland 1160-feet from Outfall 001), phosphorus load, and soil composition. A phosphorus breakthrough analysis conducted by DEQ in 2007 estimated the phosphorus breakthrough to occur in 73.2 years. Therefore, it is considered nonsignificant and will not be used as an effluent limit in this permit.

4.0 MIXING ZONE

A mixing zone is a specifically defined area of the receiving water where water quality standards may be exceeded. DEQ evaluates the suitability according to criteria established in the Administrative Rules of Montana. The mixing zone is then defined in the permit. The applicant requested a standard mixing zone for this discharge, consistent with previous permit cycles.

A standard mixing zone extends 500 feet downgradient from the source. The upgradient boundary is equal to the width of the source (measured perpendicular to the of ground water flow direction). The mixing zone widens in the downgradient direction by 5° on either side. The width of the downgradient boundary is calculated by adding the increased width for each side (the tangent of 5° (0.0875) times the mixing zone length) to the width of the upgradient boundary. Standard mixing zones extend 15 feet below the ground water table.



The volume of ground water (Q_{GW}) available to mix with the effluent is calculated using Darcy's Equation:
$Q_{GW} = KIA$

Where:
Q_{GW} = ground water flow volume (feet^3/day)
K = hydraulic conductivity (feet/day)
I = hydraulic gradient (feet/feet)
A = cross-sectional area (feet^2) at the downgradient boundary of the mixing zone.

Table 6 summarizes the variables used in Darcy's equation and the resulting volume of ground water available to mix at Outfall 001.

Table 6. Hydrogeologic and Mixing Zone Information - Outfall 001

Parameter	Units	Value
Mixing Zone Type	-	Standard
Authorized Parameters	-	Total Nitrogen
Ambient Ground Water Concentrations, Nitrate + Nitrite	mg/L	1.54
Ground Water Flow Direction	azimuth/bearing	N 42° W
Length of Mixing Zone	feet	500
Thickness of Mixing Zone	feet	15
Outfall Width, Perpendicular to Ground Water Flow Direction	feet	544
Width of Mixing Zone at Down Gradient Boundary	feet	631.5
Cross Sectional Area of Mixing Zone (A)	ft^2	9472.5
Hydraulic Conductivity (K)	feet/day	127
Hydraulic Gradient (I)	ft/ft	0.0094
Volume of Ground Water Available for Mixing (Q_{gw})	ft^3/day	11,308

To determine whether a mixing zone is allowable, DEQ calculates a predicted concentration at the downgradient end of the mixing zone. This mixing calculation follows the following procedure:

- Volume of ground water times the concentration of the parameter = existing load;
- Volume of discharge times the concentration of the parameter = waste load; and
- (Existing load + waste load) / total volume = predicted concentration.

Because the predicted concentration must satisfy the most stringent nonsignificance criterion (**Section 3**), DEQ can calculate water quality based effluent limits (WQBELs) by rearranging the equation and solving for the effluent concentration (**Section 5**).

5.0 PERMIT CONDITIONS

Discharge permits include conditions that ensure compliance with the Montana Water Quality Act and the regulations used to implement it. These conditions include effluent limits as well as any special conditions that DEQ deems necessary to protect the quality of the receiving water.

Montana's numeric water quality standards are published in Circular DEQ-7. Water quality criteria applicable to this permit are summarized below in **Table 7**. The permit establishes effluent limits that will meet water quality standards and nondegradation criteria, thereby protecting beneficial uses and existing high-quality waters. The most restrictive criteria in **Table 7** provide the basis for the effluent limits.

Table 7. Applicable Ground Water Quality Criteria

Parameter	Human Health Standard	Beneficial Use Support	Nondegradation Criteria
Nitrate plus nitrite (as Nitrogen[N])	10 mg/L	-	-
Total Nitrogen	-	10 mg/L	**7.5 mg/L**
Total Phosphorus	-	-	**>50 year breakthrough**

This discharge permit includes numeric WQBELs that restrict the strength and volume of the discharge. The ground water nonsignificance criteria provide the basis for the limits. DEQ calculates WQBELs by rearranging the mixing zone equation (**Section 4**) and solving for the effluent concentration that satisfies the water quality criteria. DEQ evaluates and recalculates the limits using updated water quality data as part of every permit renewal cycle. In this way, DEQ protects the receiving water quality by continually assessing cumulative impacts to the receiving water.

DEQ calculated the effluent limits using the same method as for the previous permit. DEQ uses updated ambient ground water quality data to re-evaluate the receiving water quality and the assimilative capacity for dilution.

5.1 TOTAL NITROGEN EFFLUENT LIMIT

The nonsignificance criterion of 7.5 mg/L is the most restrictive of the water quality criteria applicable to this permit; therefore, it is the water quality target for this effluent limit. DEQ established the final WQBEL for this discharge by back-calculating the effluent concentration that results in 7.5 mg/L at the end of the mixing zone, given the available dilution. Available dilution is determined by recent ground water quality sampling of the receiving water. Ambient total nitrogen averaged 1.54 mg/L (**Section 2.6**). DEQ calculates an effluent limit that protects receiving water quality and beneficial uses according to the following equation:

$$\underline{\text{Equation 1:}}\ C_{lmt} = C_{std} + D(C_{std} - C_{gw})$$

Where:

C_{lmt} = effluent limitation concentration
C_{std} = limiting water quality criterion
C_{gw} = ambient receiving ground water concentration
D = dilution ratio (Q_{gw} / Q_{eff})
Q_{gw} =ground water flux at the end of the mixing zone
Q_{eff} = average maximum daily discharge

Using the values provided above in **Table 6**, the result for C_{lmt} is 30.95 mg/L. This is the final WQBEL expressed as a concentration. Load limits are more appropriate for discharges to ground water since the long-term loading is the greater concern in absence of aquatic life considerations. Additionally, load limits inherently control both the strength and volume of the discharge. A discharge of 21,500 gallons per day containing 30.95 mg/L total nitrogen is equivalent to 5.55 pounds per day. The limit calculations are provided in detail in **Appendix B**.

5.2 TOTAL PHOSPHORUS EFFLUENT LIMIT

DEQ determined in the original permit (2007) that phosphorous discharged to ground water would reach an unnamed wetland 1,160 feet downgradient in 73.2 years. A phosphorous breakthrough time of less than 50 years is considered significant. Therefore, phosphorus breakthrough is considered nonsignificant.

Based on the information and analyses presented above, DEQ proposes the following numerical effluent limitations in **Table 8** below.

Table 8: Proposed Final Effluent Limits – Outfall 001

Parameter	Units	Effluent Limitations			Rationale
		Daily Maximum[1][2]	Minimum Percent Removal[1][3]		
Total Nitrogen (as N)	lbs/day	5.55	NA		Nondegradation Significance Criteria ARM 17.30.715(1)(d)(iii)
	%	NA	60		2007 Permit Limit

Footnotes:

(1) See definition in Part V of permit.

(2) Report highest measured daily value for reporting period on Discharge Monitoring Report (DMR) form.

(3) Calculated as {[(Influent TN - Effluent TN)/Influent TN]*100} using the corresponding quarterly average values as reported on the DMR form for the reporting period.

6.0 MONITORING AND REPORTING REQUIREMENTS

DEQ requires effluent and ground water monitoring to assure compliance with the effluent limitations and corresponding water quality standards. Effluent and ground water monitoring are required as conditions of this permit. All monitoring and sampling required by this permit must be representative; therefore, the permit identifies specific monitoring locations. Monitoring requirements and rationale are summarized below.

6.1 INFLUENT AND EFFLUENT MONITORING

This permit includes numeric effluent limitations with specific magnitudes and durations to ensure the discharge will not cause or contribute to an exceedance of an applicable water quality standard (see **Section 3**). So the permittee is required to monitor and report at a specified frequency to demonstrate compliance with these limitations.

Effluent samples and discharge flow measurements must be representative of the nature and volume of the effluent. The effluent sample location (EFF-001) is located at the dose tank prior to the drainfield as shown in **Figure 3**. The permittee is required to install, maintain and report flow measurements using a flow-measuring device capable of measurements that are within 10 percent of the actual flow. The flow measuring devices (FM-001, FM-002, FM-003) are located between the dose tank and the drainfield (**Figure 3**). The flow measuring devices must be in operating condition during discharge.

Table 9: Influent and Effluent Monitoring and Reporting Requirements

Parameter	Influent or Effluent	Monitoring Location	Units	Sample Type(1)(2)	Minimum Sampling Frequency	Reporting Requirements(1) (3)	Report Frequency	Rationale
Flow Rate(4)(5)	Effluent	Flow Meter	gpd	Continuous	Continuous	Daily Max and Quarterly Average	Quarterly	Permit Compliance/ Effluent Characterization
Biochemical Oxygen Demand (BOD_5)	Effluent	Dose Tank	mg/L	Grab	1/Quarter	Quarterly Average	Quarterly	Proper O & M/ Effluent Characterization
Total Suspended Solids (TSS)	Effluent	Dose Tank	mg/L	Grab	1/Quarter	Quarterly Average	Quarterly	Proper O & M/ Effluent Characterization
Nitrate + Nitrite (as N)	Effluent/ Influent	Dose Tank/ Inf. M.P.(11)	mg/L	Grab	1/Quarter	Daily Max and Quarterly Average	Quarterly	Permit Compliance/ Proper O & M
Total Ammonia (as N)	Effluent	Dose Tank	mg/L	Grab	1/Quarter	Daily Max and Quarterly Average	Quarterly	Proper O & M
Total Kjeldahl Nitrogen (as N)	Effluent/ Influent	Dose Tank/ Inf. M.P.(11)	mg/L	Grab	1/Quarter	Daily Max and Quarterly Average	Quarterly	Permit Compliance
Total Nitrogen (as N)(5)(6)	Influent	Inf. M.P.(11)	mg/L	Calculate	1/Quarter	Quarterly Average	Quarterly	Permit Compliance
	Effluent	Dose Tank	mg/L	Calculate	1/Quarter	Daily Max and Quarterly Average	Quarterly	
			lbs/day(9)	Calculate				
	Percent Removal(7)	NA	%	Calculate	1/Quarter	Quarterly Average	Quarterly	
Total Phosphorus (as P)(5)(8)	Effluent	Dose Tank	mg/L	Grab	1/Quarter	Daily Max and Quarterly Average	Quarterly	Permit Compliance

Footnotes:

NA = Not Applicable

(1) See definitions in Part V of the permit.

(2) Grab sample will represent concentration for a 24-hour period.

(3) Daily Maximum: Report highest measured daily value for the reporting period on Discharge Monitoring Report (DMR) form.

(4) If no discharge occurs during the reporting period, "No Discharge" shall be recorded on the DMR report form.

(5) Requires recording device or totalizing meter, must record daily effluent volume.

(6) Total Nitrogen is the sum of the Nitrate + Nitrite and Total Kjeldahl Nitrogen parameters.

(7) Percent Removal is calculated as: {[(Influent Total Nitrogen-Effluent Total Nitrogen)/Influent Total Nitrogen] * 100} using the corresponding quarterly average values as reported on the DMR form.

(8) Annual maximum load shall be reported on an annual basis on a DMR (due on January 28 of each year of the permit cycle).

(9) Load calculation: lbs/day = concentration (mg/L) x flow (gpd) x [8.34×10^{-6}].

Effluent monitoring and reporting requirements are summarized in **Table 8** above. All analytical methods must be in accordance with the Code of Federal Regulations, 40 CFR Part 136 for each monitored parameter.

PUBLIC NOTICE

Legal notice information for water quality discharge permits are listed at the following website: http://deq.mt.gov/Public/notices/wqnotices. Public comments on this proposal are invited any time prior to close of business on January 18, 2019 . Comments may be directed to:

DEQWPBPublicComments@mt.gov

or to:

Montana Department of Environmental Quality
Water Protection Bureau
PO Box 200901
Helena, MT 59620

All comments received or postmarked prior to the close of the public comment period will be considered in the formulation of the final permit. DEQ will respond to all substantive comments pertinent to this permitting action and may issue a final decision within thirty days of the close of the public comment period.

All persons, including the applicant, who believe any condition of the draft permit is inappropriate, or that DEQ's tentative decision to deny an application, terminate a permit, or prepare a draft permit is inappropriate, shall raise all reasonably ascertainable issues and submit all reasonably available arguments supporting their position by the close of the public comment period (including any public hearing). All public comments received for this draft permit will be included in the administrative record and will be available for public viewing during normal business hours.

Copies of the public notice are mailed to the applicant, state and federal agencies, and interested persons who have expressed interest in being notified of permit actions. A copy of the distribution list is available in the administrative record for this draft permit. Electronic copies of the public notice, draft permit, fact sheet, and draft environmental assessment are available at the following website: http://deq.mt.gov/Public/notices/wqnotices.

Any person interested in being placed on the mailing list for information regarding this permit may contact the DEQ Water Protection Bureau at (406) 444-5546 or email DEQWPBPublicComments@mt.gov. All inquiries will need to reference the permit number (MTX000189), and include the following information: name, address, and phone number.

During the public comment period provided by the notice, DEQ will accept requests for a public hearing. A request for a public hearing must be in writing and must state the nature of the issue proposed to be raised in the hearing.

APPENDIX A – MONITORING WELL SUMMARY

MONTANA WELL LOG REPORT

Form No. 603 R2-04

1N 27E 19 CC

Well ID# _____

This log reports the activities of a licensed Montana well driller and serves as the official record of work done within the borehole and casing and describes the amount of water encountered. **This form is to be completed by the driller and filed with MBMG within 60 days of completion of the work. Acquiring Water Rights is the well owner's responsibility and is not accomplished by the filing of this report.**

Well log information is stored in the Groundwater Information Center at the Montana Bureau of Mines and Geology (Butte) and water right information is stored in the Water Rights Bureau records (Helena).

For fields that are not applicable, enter NA. Record additional information in the REMARKS section.

1. WELL OWNER:
Name Town Pump Inc
ok
Mailing address P.O. Box 6000
Butte, MT 59702

2. WELL LOCATION: List ¼ from smallest to largest
_____ ¼ _____ ¼ SW ¼ SW ¼, Section 19
Township 4 N/S Range 7 E/W County Yellowstone
Lot _____, Tract/Blk _____ Subdivision Name _____
Certificate of Survey 1525
Well Address 2311 W. Frontage Rd. Bty, MT
GPS ☑ Yes ☐ No
Latitude N45°48.804 Longitude W112° 25.130
Error as reported by GPS locator (± feet) 10
Horizontal datum ☐ NAD27 ☑ WGS84

3. PROPOSED USE: ☐ Domestic ☐ Stock ☐ Irrigation
☐ Public water supply ☑ Monitoring Well
☐ Geothermal ☐ Closed System ☐ Open System ☐ Reinjection
☐ Extraction H_2O Temp _____ Number of Wells in System _____
☐ Other: _____

4. TYPE OF WORK: well # north
☑ New well ☐ Deepen existing well ☐ Abandon existing well
Method: ☐ Cable ☑ Rotary ☐ Other: _____

5. WELL CONSTRUCTION DETAILS:
Borehole:
Dia. 6 in. from 0 ft. to 32 ft.
Dia. _____ in. from _____ ft. to _____ ft.
Dia. _____ in. from _____ ft. to _____ ft.

Casing:
Steel: Wall thickness .250 ☐ Threaded ☑ Welded
Dia. 6⅝ in. from 1'8" ft. to 18 ft.
Dia. _____ in. from _____ ft. to _____ ft.
Casing Shoe: ☐ Yes ☑ No

Plastic: Pressure Rating Sch 40 lbs. ☑ Threaded ☐ Welded
Dia. 2"-10 in. from 11'4 ft. to 26 ft.

Perforations/Slotted Pipe:
Type of perforator used _____
Size of perforations/slots _____ in. by _____ in.
_____ no. of perforations/slots from _____ ft. to _____ ft.
_____ no. of perforations/slots from _____ ft. to _____ ft.

Screens: ☑ Yes ☐ No
Material PVC
Dia. 2 Slot size .010 from 26 ft. to 46 ft.
Dia. _____ Slot size _____ from _____ ft. to _____ ft.

Gravel Packed: ☑ Yes ☐ No
Size of gravel 10/20 Silica Sand
Gravel placed from 24 ft. to 46 ft.

Packer: ☐ Yes ☑ No
Type _____ Depth(s) _____

Grout: Material used 3/8 Bentonite Chips
Depth from 0 ft. to 24 ft. OR ☐ Continuous feed

6. WELL TEST DATA: 46.52
A well test is required for all wells. (*See details on well log report cover.*)
☑ Static water level 30 ft. below top of casing **or**
☐ Closed-in artesian pressure _____ psi.
How was test flow measured:
bucket/stopwatch, weir, flume, flowmeter, etc _____
Yellowstone Controlled Groundwater Area - Water Temperature _____ °F
☐ AQUIFER TEST DATA FORM ATTACHED

Test - 1 hour minimum
Drawdown is the amount water level is lowered below static level.
All depth measurements shall be from the top of the well casing.
Time of recovery is hours/minutes since pumping stopped.

Air test*
_____ gpm with drill stem set at _____ ft. for _____ hours
Time of recovery _____ hrs/min. Recovery water level _____ ft.

OR Bailer test*
N/A gpm with _____ ft. of drawdown after _____ hours
Time of recovery _____ hrs/min. Recovery water level _____ ft.

OR Pump test*
Depth pump set for test _____ ft.
_____ gpm pump rate with _____ ft. of drawdown after _____ hrs pumping
Time of recovery _____ hrs/min. Recovery water level _____ ft.

OR Flowing Artesian*
_____ gpm for _____ hours
Flow controlled by _____

**During the well test the discharge rate shall be as uniform as possible. This rate may or may not be the sustainable yield of the well. Sustainable yield does not include the reservoir of the well casing.*

7. WELL LOG: Record depth(s) that water is encountered. HG

Depth, Feet From	Depth, Feet To	Material: color/rock and type/descriptor (example: blue/shale/hard, or brown/gravel/water, or brown/sand/heaving)
0	1	Topsoil
1	7	Clay
7	42	Powder River Sand
		2" Thick Clay Sand
		at 34'-34'2"

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☐ ADDITIONAL SHEETS ATTACHED

8. DATE WELL COMPLETED: 12/2/15

9. REMARKS: _____

10. DRILLER/CONTRACTOR'S CERTIFICATION:
All work performed and reported in this well log is in compliance with the Montana well construction standards. This report is true to the best of my knowledge.
Name, firm, or corporation (print) A-1 Drilling
Address P.O. Box 739, Laurel, MT 59044
Signature _____
Date _____ License no. 572
License type: ☐ MWC ☑ WWC ☐ WWD

Montana Bureau of Mines & Geology
The University of Montana
1300 West Park Street
Butte, MT 59701

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285612

MONTANA BUREAU OF MINES AND GEOLOGY COPY

APPENDIX B – EFFLUENT LIMIT CALCULATIONS

Water Quality Based Effluent Limitations – Nitrogen

The system consists of a Recirculating Sand Filter (RSF) system (Class 2 method for nitrogen treatment).

To protect beneficial uses [ARM 17.30.1006(1)(b)(ii)], there shall be no increase of a parameter to a level that renders the waters harmful, detrimental, or injurious to the beneficial uses. Therefore, no wastes may be discharged such that the waste either alone or in combination with other wastes will violate or can reasonably be expected to violate any standard. DEQ will establish the effluent limitations for nitrogen based on the projection that the entire nitrogen load in the wastewater stream may ultimately be converted to nitrate (USEPA, 2002a).

The allowable discharge concentrations are derived from a mass-balance equation (ARM 17.30.517) which is a simple steady-state model, used to determine concentration after accounting for other sources of pollution in the receiving water and any dilution as provided by a mixing zone. The mass-balance equation (Equation 1) derived for ground water is as follows:

Equation 1:

$$Q_{gw}C_{gw} + Q_{eff}C_{eff} = Q_{comb}C_{proj}$$

Where:

Q_{gw}	=	ground water available for mixing
C_{gw}	=	ambient receiving ground water concentration
Q_{eff}	=	maximum design capacity of wastewater system
C_{eff}	=	effluent pollutant concentration
Q_{comb}	=	combined ground water and effluent ($Q_{comb} = Q_{gw} + Q_{eff}$)
C_{proj}	=	projected pollutant concentration (after available mixing)

The mass-balance equation has been arranged to calculate effluent limits so that the discharge does not cause or contribute to an exceedance of the most restrictive water quality standard. This equation can be applied to any effluent and receiving water where the applicable dilution ratio is known. This equation will only be used for nitrogen which has been authorized mixing (Section III).

Equation 2:

$$C_{lmt} = C_{std} + D(C_{std} - C_{gw})$$

Where:
C_{lmt} = effluent limitation concentration
C_{std} = water quality standard concentration = 7.5 mg/L
C_{gw} = ambient receiving ground water concentration = 1.54 mg/L
D = dilution ratio (Q_{gw} / Q_{eff}) = 84,584 / 21,500

$$C_{lmt} = 7.5 + (84{,}584 / 21{,}500)(7.5 - 1.54) = \mathbf{30.95\ mg/L}$$

A mass-balance approach is used to calculate the effluent quality of the discharge that meets the most restrictive water quality standard at the end of the mixing zone. Numeric effluent limitations are expressed as loads since this type of limitation inherently regulates both volume and strength of the effluent as prescribed by 75-5-402(3), MCA. Load limits ensure compliance with the ground water standards at the end of the mixing zone. Based on the proposed design capacity, the respective load effluent limitation is:

5.55 lb/day

[$(8.34*10^{-6})$* 30.95 mg/L*21,500gpd]

as based on the following equation:

Equation 3:

$$L_{lmt} = CON * C_{eff} * DC_{eff}$$

Where:

L_{lmt} = effluent limitation-load

C_{eff} = allowable effluent concentration

DC_{eff} = design capacity of wastewater treatment system (gpd)

CON = conversion factor [$8.34*10^{-6}$]

The Final Effluent Limits are summarized in Table 8 for Outfall 001.